



North Carolina Department of Transportation

Chapter 12 Erosion and Sediment Control

January 2022



Revisions Sheet			
Page	Old Section	New Section	Description
-	-	-	<ul style="list-style-type: none">• Entire Chapter revised to new format• All references and links have been updated throughout Chapter
2	12.1.3	12.1.3	2nd bullet, 5th sentence - removed "a specific" and replaced with "the Department's"
4	12.3	12.3	A sentence was added to the end of the 3 rd paragraph
6		12.4	Added new section - References
7		12.5	Added new section – Additional Documentation
7	Appendix F	12.5	Added Stilling Basin Dimensions and Volume drawing and Culvert Construction Sequence drawing.



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12.1 Introduction

The North Carolina Sedimentation Control Commission first delegated an erosion and sediment control program to NCDOT in 1974. Controlling accelerated erosion and sedimentation is critical for the protection of water quality in streams and water bodies receiving drainage from NCDOT projects. This chapter addresses erosion and sediment control on NCDOT projects and compliance with applicable state and federal regulations.

12.1.1 Effects of Accelerated Erosion and Sedimentation

Erosion and sedimentation can cause or contribute to many water quality related problems, including:

- elevated turbidity
- increased water temperature
- decreased dissolved oxygen
- increased algae growth
- loss of aquatic habitat
- reduced stream conveyance
- increased flooding
- reduced storage volume in reservoirs
- increased filtration costs for municipal water supplies

12.1.2 Erosion and Sediment Control Requirements

The Division of Energy, Minerals and Land Resources - Land Quality Section in the North Carolina Department of Environmental Quality (NCDEQ, formerly NCDENR) enforces the North Carolina Sedimentation Pollution Control Act of 1973 and Administrative Rules. This Act applies to land-disturbing activities for public or private development and highway construction and maintenance. Because of the magnitude of land-disturbance conducted by NCDOT, the Sedimentation Control Commission within NCDEQ delegated authority to the Division of Highways to implement an erosion and sediment control program with periodic project inspections and an annual audit by the Land Quality Section. NCDOT is responsible for complying with all statutory and administrative rules and all requirements stipulated in the program delegation.

- The Federal Clean Water Act (CWA) and the National Pollutant Discharge Elimination System (NPDES) require that construction activities control the discharge of pollutants in stormwater runoff including sediment. Each is enforced by the United States Environmental Protection Agency (USEPA) and by the Division of Energy, Minerals and Land Resources (DEMLR) and the Division of Water



Resources (DWR) within the NCDEQ through delegation of authority from the USEPA. An NPDES permit is required to discharge stormwater. In North Carolina, NPDES General Permit – [NCG 010000](#) covers construction activities. The permit complies with State erosion and sediment control requirements along with other stormwater pollution prevention requirements. NCDOT must comply with the Department's NPDES stormwater permit ([NCS000250](#)), which incorporates the requirements NCG 010000, and State nutrient management strategy rules. Both are discussed in [Chapter 13](#).

12.2. NCDOT Erosion and Sediment Control Program

The Roadside Environmental Unit (REU) within the Division of Highways has primary responsibility for implementing the delegated NCDOT erosion and sediment control program. The REU prepares erosion control plans; develops and maintains erosion and sediment control standards, details, and specifications; develops project special provisions; produces training materials for erosion and sediment control; and monitors active worksites for compliance with the Sedimentation Pollution Control Act and NCG 010000.

12.2.1 Erosion and Sediment Control Plans

Within the REU, the Soil and Water Engineering Section is responsible for designing and approving erosion and sediment control plans for land-disturbing activities of one or more contiguous acres associated with NCDOT highway construction. Plan designs consider several factors, including construction sequencing, existing topography, proposed land grades, soil type, hydrology, design storm, required trapping efficiency for certain devices, classifying receiving waters, critical habitat areas, and other identified environmental concerns.

Refer to the website below for information regarding the NCDOT erosion and sediment control program including design requirements for devices used on highway construction projects.

<https://connect.ncdot.gov/resources/roadside/Pages/Soil-Water.aspx>

12.2.2 Riparian Buffer Rules

The North Carolina Environmental Management Commission (EMC) has presently adopted riparian buffer rules in the Neuse River Basin, the Randleman Lake Water Supply Watershed, the Tar-Pamlico River Basin, along the Catawba River main stem, the Goose Creek Water Supply Watershed and the Jordan Lake Water Supply Watershed. Highway construction projects are subject to these rules and must preserve vegetated riparian buffer zones along streams and rivers. These regulatory buffers



provide for only certain types of minimally invasive encroachments. More extensive encroachments must be permitted by the NC Division of Environmental Quality (NCDEQ, formerly NCDENR) DWR. The rules that are currently in effect can be found in 15A NCAC 02B.0233, 15A NCAC 02B.0250, 15A NCAC 02B.0259, 15A NCAC 02B.0243, 15A NCAC 02B.0607, 15A NCAC 02B.0267 respectively. As new buffer rules are adopted or existing rules are modified by the EMC, these regulatory codes will be updated accordingly.

12.2.3 Erosion and Sediment Control Inspections

NCDOT Project Inspectors and the REU Field Operations Sections perform inspections of highway construction activities to ensure compliance with all erosion and sediment control requirements and evaluate plan implementation as well as installation, maintenance, and effectiveness of devices. A report is generated for all inspections noting corrective actions, if needed.

Project Inspectors perform inspections at least weekly and more often after periods of rainfall, with Inspectors recording their findings in a daily report. The Inspector gives a list of all needed corrections to the contractor, with a copy provided the Resident Engineer or the District Engineer for maintenance projects.

REU Field Operations staff perform inspections monthly. If significant problems or potential violations are observed, an Immediate Corrective Action (ICA) is issued to the Resident or District Engineer. Corrective actions must begin within 24 hours, and grading operations can be suspended until all problems are resolved. Field Operations staff will revisit the site within five working days or seven calendar days, whichever is shorter. Serious violations can result in the issuance of a Notice of Violation (NOV) by the NCDEQ Land Quality Section and possible enforcement actions.

12.3. Culvert Construction Sequence

Provide a culvert construction sequence plan for each culvert that provides a total waterway opening of 30 square feet or greater, and deliver these plans to Structures Management, Roadside Environmental, and Traffic Management Units to assist with culvert construction. The construction sequence plan includes a construction sequence narrative and figure(s), which provide a description of the phases required to construct the culvert to manage water conveyance and erosion control. The construction sequence plan serves as a reasonable and acceptable method to accomplish construction; however, there may be other methods that are more appropriate and acceptable. Construction sequencing should be discussed and agreed upon during the field inspection. The REU will develop the final construction sequence plan and include it in the project's erosion control plans.



The Hydraulic Design Engineer is responsible for the calculations required for the construction sequence plan, including stream diversion flows, pipe and diversion channel sizing for stream flows, volumes for sediment basin and sediment bags, and excavation quantities for diversion channels.

Size temporary stream diversions and pipes for the mean daily flow, which should be computed based on the normal water surface elevation (vegetation line, also known as ordinary high water) in the channel as determined from field review. Using this flow depth, determine the mean daily flow by the Manning and Continuity equations.

Volume needed for temporary basins or sediment bags for treatment of dewatering effluent from construction areas are calculated using the following formula:

$$V_b = [L \times W \times (NWS+1)]/27$$

Where:

V_b = Volume needed for temporary basin or sediment bags (yd³)

L = Length of culvert plus required construction access (ft)

W = Width of culvert plus required construction access (ft)

NWS = Normal Water Surface depth (ft)

Note that 1 foot depth is added to the NWS depth to account for base excavation.

Basin volume (V_b) and trapezoidal basin dimensions for a temporary stilling basin per Standard Drawing 1630.04 (NCDOT, 2018) necessary to provide the target volume can be calculated using the Temporary Stilling Basin Dimensions and Volume Calculator shown in Section 12.5, which can be downloaded from the [Hydraulics Unit website](#).

Estimate the required excavation volumes for temporary diversion channels by taking the largest excavation cross-section area and multiplying by the length of the diversion channel.

An example of a culvert construction sequence plan is provided in Section 12.5.

The culvert construction sequence plan should include:

1. Narrative describing culvert construction phasing and other noteworthy information
2. Figure(s) depicting the following:
 - culvert construction phases
 - diversion channels or pipes with sizing calculations
 - drainage ditch excavation volume
 - sediment basin or bags with location and temporary drainage easement
 - temporary dikes
 - roadway drainage and roadway features as shown on plans



12.4. References

NCDOT. (2018). *Roadway Standard Drawings*. Retrieved December 2021, from <https://connect.ncdot.gov/resources/Specifications/Pages/2018-Roadway-Standard-Drawings.aspx>

12.5. Additional Documents

STILLING BASIN DIMENSIONS

Station:

Calculated by:

STILLING BASIN DIMENSIONS AND VOLUME

DIMENSIONS FOR BASIN VOLUME

Culvert Length + Access = 21 ft

Culvert Width + Access = 11 ft

Normal Water Surface Depth = ft

INSIDE BASIN DIMENSIONS

Length = 16 ft

Width = 8 ft

OUTSIDE BASIN DIMENSIONS

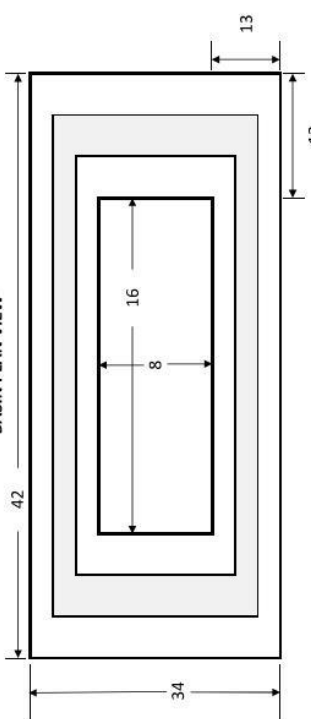
Length = 42 ft

Width = 34 ft

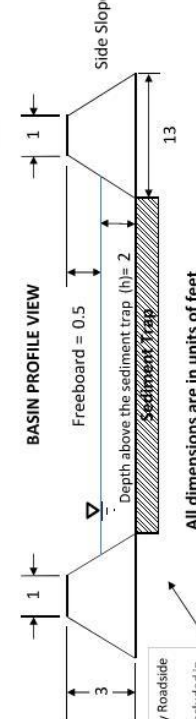
BASIN WATER VOLUME [V_b]

V_b = 18 cu yd

BASIN PLAN VIEW



BASIN PROFILE VIEW



All dimensions are in units of feet

Sediment Trap to be sized by Roadside Environmental Unit.
Sediment Trap volume not included in basin volume calculation.

This form can be downloaded from the Hydraulics Unit website.

Figure 1. Temporary Stilling Basin Calculator

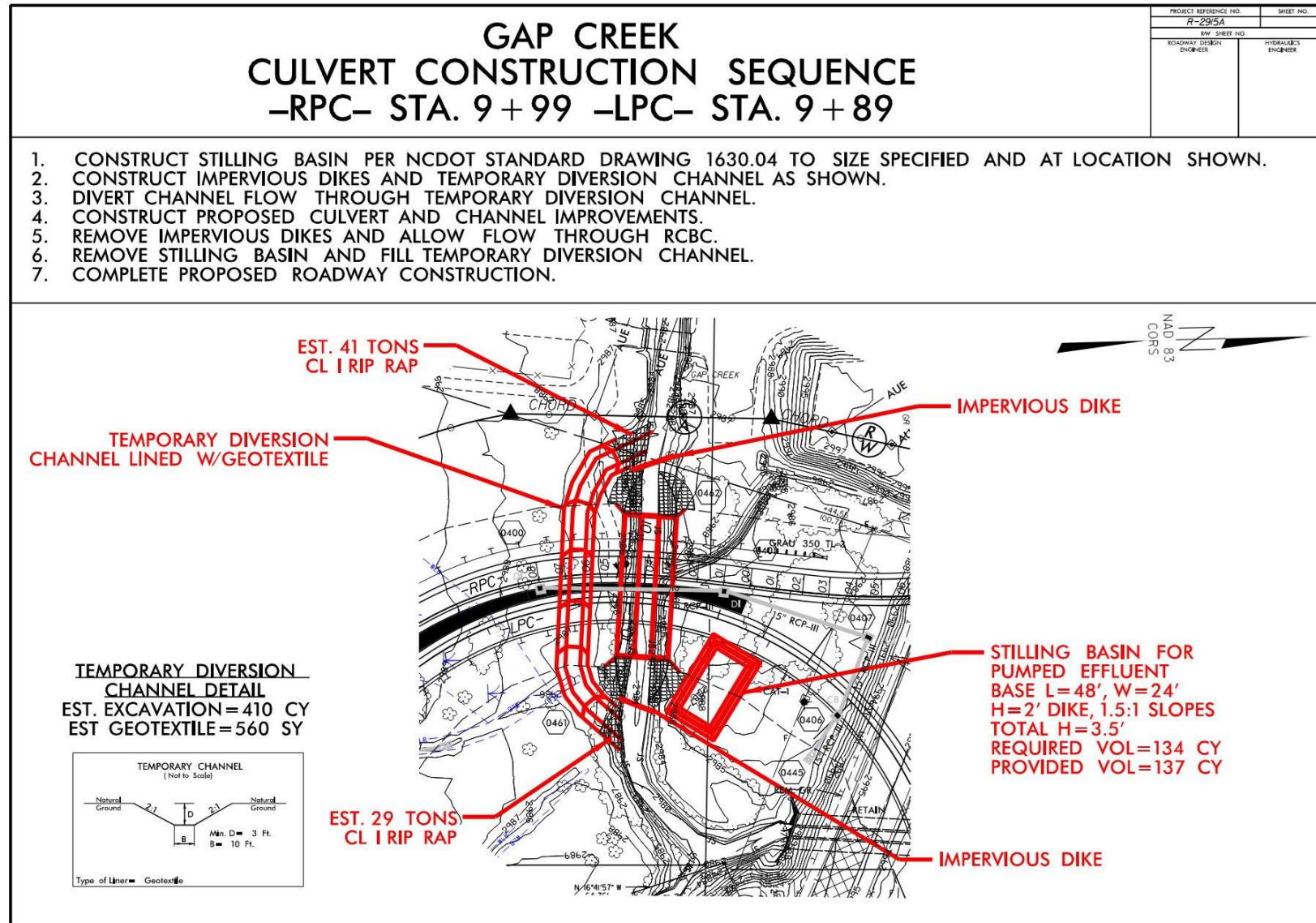


Figure 2. Culvert Construction Sequence Plan Example